

## Life Table

Actuarial calculations use  ${}_tq_x$  and  ${}_tp_x$  extensively and to calculate these life tables are produced. The basic life table is a tabulation of  $l_x$  where  $x$  goes from 0 to  $\omega$ . If  $l_0$  represents the number of lives at age 0, then  $l_x$  represents the expected number of those lives who will survive to age  $x$ .

Therefore,  $l_x = l_0 \cdot \prod_{t=0}^{x-1} p_t$

$d_x$  is defined as the number of lives expected to die between ages  $x$  and  $x+1$ .

Therefore  $d_x = l_{x+1} - l_x$

$q_x = d_x / l_x$

The English Life Tables (ELT) are produced using population data obtained from the decennial census.

The Continuous Mortality Investigation Bureau (CMIB) produces life tables from data supplied by insurance companies and this relates only to so called "insured lives". In general this means that the rates of mortality will be lower for CMIB tables than for ELT.

The CMI was established in the 1920s by the actuarial profession and the following is an extract from their 2005 Review:

*The Continuous Mortality Investigation is the largest single research project organised by the UK Actuarial Profession. It has been accumulating and analysing data on mortality and morbidity risks arising under life assurance, annuity and pension business for over 80 years. Although organised by the professional body and paid for by those life offices, reinsurers and others who use its analytical and benchmarking services, it is constituted independently as a research organisation. Individual contributors' data is carefully protected, but the vast aggregate database is a valuable resource to contributors, to the industry and supervisors, and to actuaries and other professionals with a commercial or research interest. The CMI benefits from the volunteer effort of many actuaries and others with an interest in its subject matter.*

*Traditionally the CMI publishes results and analyses on quadrennial data to reduce the impact of fluctuations that may occur in individual years. The coincidence of work on the main CMI investigations into Mortality, Income Protection and Critical Illness resulted in unprecedented levels of activity during the past year. Completion of this work will mean a further increase in activity during the forthcoming year. The degree of interest in mortality and morbidity, and hence in CMI activity from the insurance industry, the wider actuarial profession, pension funds, government, regulators and the press has increased dramatically in recent times. Queries from the press and other sources bear testimony to this, as do the number of invitations to talk about the work of the CMI at professional and other events.*